## REMARKS/ ARGUMENTS

Applicant has carefully studied the final Examiner's Action mailed April 2, 2008, having a shortened statutory period for response set to expire, with one month extension, August 2, 2008. The amendment appearing above and these explanatory remarks are believed to be fully responsive to the Action. Accordingly, this important patent application is now believed to be in condition for allowance.

Applicant responds to the outstanding Action by centered headings that correspond to the centered headings employed by Office, to ensure full response on the merits to each finding of Office.

### *Claim Rejections - 35 U.S.C. § 103*

Claims 1, 5-12, and 14-18 stand rejected under 35 U.S.C. § 103(a), as being unpatentable in light of Pittenger, et al. (U.S. Pat. 6,387,369) in view of Erices, et al. (Br. J. Haem., 1999), Edelberg, et al. (U.S. Appl. 2003/0091547 A1) and Lim, et al. (Bone Marrow Trans., 1999, 24:965-970).[1] Office found Pittenger teaches a method of regenerating cardiac muscle by administering mesenchymal stem cells to the infarct zone, locally or systemically, to reduce scar formation and augment cardiac function. Office went on to state Erices teaches the umbilical cord blood is a source of mesenchymal progenitor cells which can differentiate into muscle. The combination of Pittenger and Erices was found motivated because mesenchymal progenitor cells in UCB are capable of differentiating into muscle[2] and cardiac myocytes can be differentiated from endothelial precursor cells, such cells derived from UCB.[3] Office also found Lim teaches "UCS contain about 11 million white blood cells per ml[.]"[4] The proposed combination fails to obviate the invention because the combination fails to teach the present invention.

The claimed invention provides for treating cardiomyopathy, myocardial infarction, or congenital heart disease by "administering an effective amount of a composition comprising an umbilical cord blood cell to an individual with a circulatory disorder."[5] The claims further

[1] Page 3 of the non-final Office Action, dated April 2, 2007.
[2] *Id.* (Using Erices to teach the motivation).
[3] *Id.* at pages 3-4 (Using Edelberg to teach the motivation).
[4] *Id.* at page 5.
[5] Amended Claim 1

provide the circulatory disorder is a cardiac disorder.[6] Additionally, some claims require the umbilical cord blood to grow into cardiac muscle.[7] In determining a *prima facie* case of obviousness[8], all words of a claim must be considered.[9] Office contends the references teach administration of UCB, taught by Erices, to regenerate cardiac muscle, as taught by Pittenger.[10]

Pittenger teaches the administration of cells to regenerate or repair cardiac muscle by introducing mesenchymal stem cells, "obtained from culturing adherent marrow or periosteal cells[.]"[11] At the time of filing, and afterwards, the art was split as to the ability of full-term UCB to generate multipotent mesenchymal stem cells.[12] Further, the art has questioned the use of umbilical cord mesenchymal cells in place of bone marrow-derived mesenchymal cells.[13] While Erices teaches that umbilical cord blood possesses mesenchymal progenitor cells, and that MPCs are "precursors for bone marrow stromal cells, bone cartilage, muscle and connective tissue[,]"[14] Erices fails to teach that mesenchymal cells may differentiate into cardiac muscle,[15] which is significantly biologically different from skeletal muscle. Furthermore, Erices does not address the ability of umbilical cord blood cells to form multipotent stem cells. Edelberg teaches that endothelial cells, when exposed to PDGF, may differentiate into cardiac tissue or stimulate cardiac regeneration.[16] Edelberg further states PDGF and PDGFR-α are required for allograft survival.[17] However, Edelberg fails to teach the administration of UCB or UCB-derived MSC,

---

[6] *Id.* (Providing for one of the following cardiovascular disorders; cardiomyopathy, myocardial infarction, and congenital heart disease).
[7] Amended Claim 12.
[8] MPEP 2142.
[9] MPEP 2143.03.
[10] Page 3 of the non-final Office Action, dated April 2, 2008.
[11] Pittenger, et al., U.S. 6,387,369, column 1, lines 42-45; column 2, lines 8-14.
[12] S. Kern, et al., Comparative Analysis of Mesenchymal Stem Cells from Bone Marrow, Umbilical Cord Blood, or Adipose Tissue, Stem Cells, 24:1294-1301, page 1294, column 1 (2006).
[13] *Id.* at page 1300, columns 1-2 (Concluding that UCB-derived MSC lack the same multipotential as bone marrow- or adipose-derived MSC after finding UCB-MSC cannot differentiate into adipose tissue).
[14] Erices, et al., Mesenchymal Progenitor Cells in Human Umbilical Cord Blood, Br. J. Haemat., 109: 235-242, page 235, column 1 (2000).
[15] Cited references: D. Prockop, et al., Marrow Stromal Cells as Stem Cells for Nonhematopoietic Tissues, Science, 276: 71-74, abstract (Stating MSC can form myoblasts*); G. Ferrari, et al., Muscle Regeneration by Bone Marrow-Derived Myogenic Progenitors, Science, 279: 1528-1530, abstract (Discussing the growth and repair of skeletal muscle); P. Conget & Minguell, Phenotypical and Functional Properties of Human Bone Marrow Mesenchymal Progenitor Cells, J. Cell. Physio., 181: 67-73, abstract (Not differentiating between muscle types); M. Pittenger, et al., Multilineage Potential of Adult Human Mesenchymal Stem Cells, Science, 284: 143-147, abstract (Not differentiating between muscle types).
*Myoblast is defined as a cell that gives rise to skeletal muscle cells. http://cancerweb.ncl.ac.uk/cgi-bin/omd?myoblast (last accessed April 22, 2008).
[16] Edelberg, et al., U.S. 2003/0091547A1, page 5, paragraph 64; page 9, paragraph 120; page 13, paragraph 168.
[17] *Id.* at page 13, paragraph 168.

and therefore also fails to address the ability of umbilical cord blood cells to form multipotent stem cells. Lim addresses the composition of UCBC, as identified by surface markers, [18] but also fails to teach the use of umbilical cord blood in treatment of circulatory disorders. As such, the combination fails to teach the administration of UCB or UCB-derived MSC, and fails to teach MSC can differentiate into cardiac muscle, which is required by the rejected claims. Finally, Office rejected the claims under the premise that UCBC form mesenchymal stem cells which regenerate or repair cardiac muscle as shown by Pittenger. Applicant respectfully points out that, with the exception of claims 8 and 16, the invention is not limited to solely mesenchymal umbilical cord blood cells, but rather the invention provides that UCBC may be used for treatment.

Accordingly, it is respectfully requested that Office reconsider claims, 1, 5-12, and 14-18 and withdraw the rejection under 53 U.S.C. § 103(a).

***Conclusion***

Applicant respectfully requests that a timely Notice of Allowance be issued in this case. If the Office is not fully persuaded as to the merits of Applicant's position, or if an Examiner's Amendment would place the pending claims in condition for allowance, a telephone call to the undersigned at (813) 925-8505 is requested.

Very respectfully,

SMITH & HOPEN

By:_____

Dated: August 4, 2008

Anton Hopen
Reg. No. 41,849
180 Pine Avenue North
Oldsmar, Florida 34677
Attorneys for Applicant

[18] F. Lim, et al., The Number of Nucleated Cells Reflects the Hematopoietic Content of Umbilical Cord Blood for Transplantation, Bone Marrow Trans. 24:965-970, page 965, column 1 (1999).

*CERTIFICATE OF ELECTRONIC TRANSMISSION*

**(37 C.F.R. 2.190 (b))**

I HEREBY CERTIFY that this correspondence is being electronically transmitted to the Patent and Trademark Office through EFS Web on August 4, 2008.

/lauren reeves/

Date: August 4, 2008

Lauren Reeves